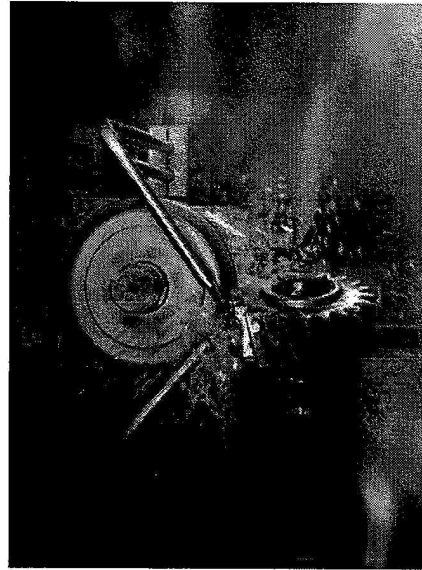


Gear Finishing Technology

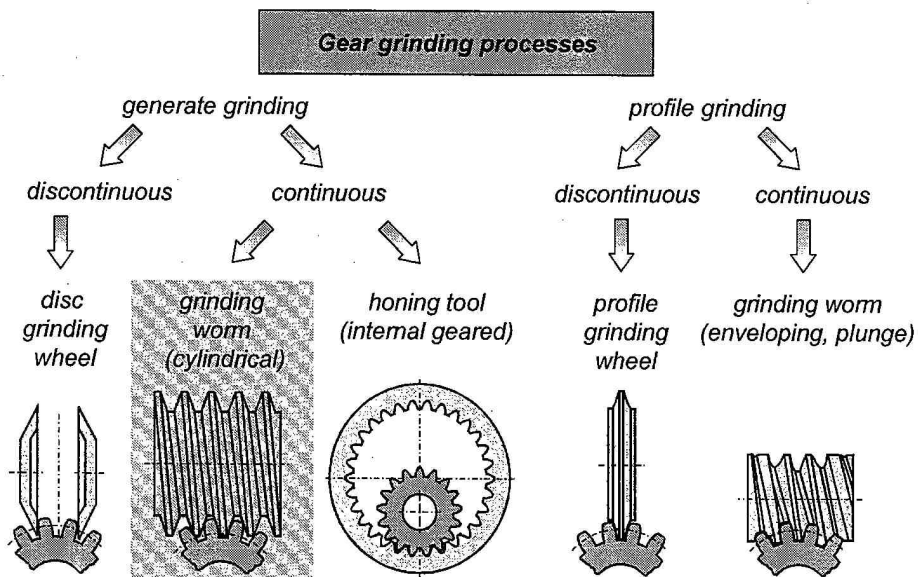
- Honing
- Form Grinding
- Generating Grinding

John Lange
Product Manager
February 2006



1

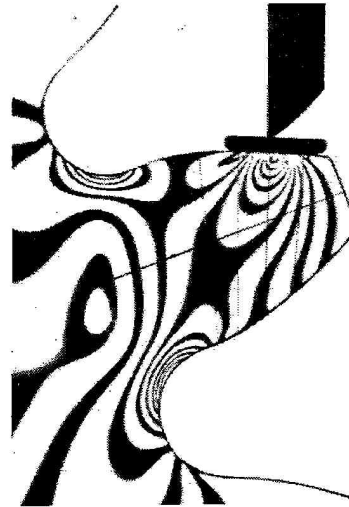
Gear grinding processes



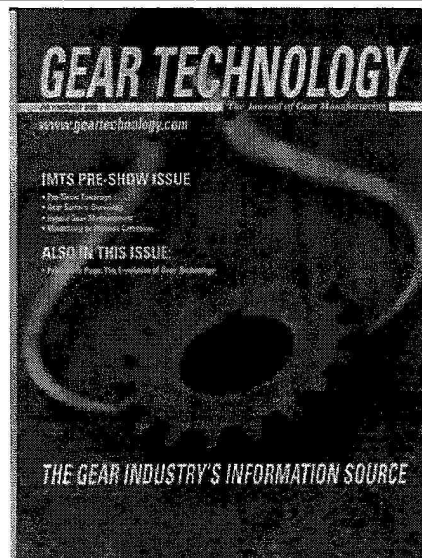
2

Fillet Root and Contact Stress
Note the root is in tensile and compressive stress

Higher tooth contact ratio and face contact with the need to distribute the load over the face width and involute, reduces the potential for pitting!



July/Aug 2002 Issue Has an Interesting Article on Gear Surface Durability For Automotive Transmission Gears



General Motors Residual Stresses Measured Results (From Gear Technology Magazine Article July/Aug 2002 Issue)

A Few Examples of How Residual Stresses Are Produced In Gears:

- Machining without heat input to the gear
- Machining that puts the heat into the chip not the gear, i.e. CBN Micro Machining
- Machining with pressure and low heat, i.e. honing with ceramic wheels

The GM Article Basically Said Superior Surface Durability Is The Result Of:

- Sun and pinion both honed
- Superior surface finish and residual stress pattern
- The surface hardness
- Superior tooth geometry
- Planet tooth surface roughness has a significant effect on sun gear surface durability

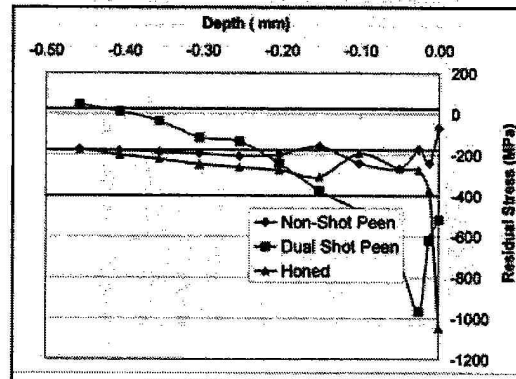


Figure 10—Residual stresses produced by different manufacturing processes.

5

Residual Compressive Stresses

Workpiece:

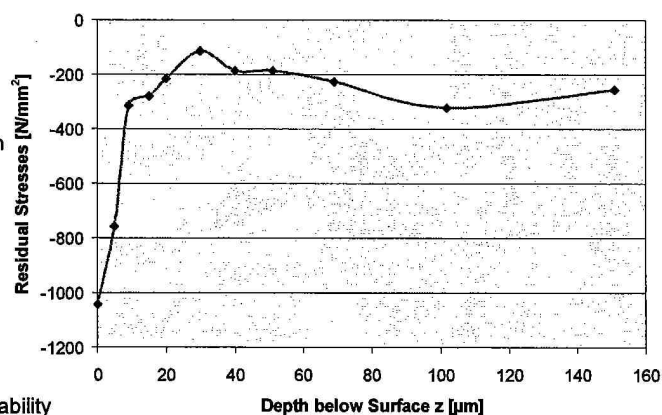
No. of teeth 47
Module 1,82 mm
 α 17°
 β -33°
O.D. 106,3 mm
Face width 18,5 mm

Honing tool:

No. of teeth -121
RPM 1,000

Machine:

ZH 250



Advantages

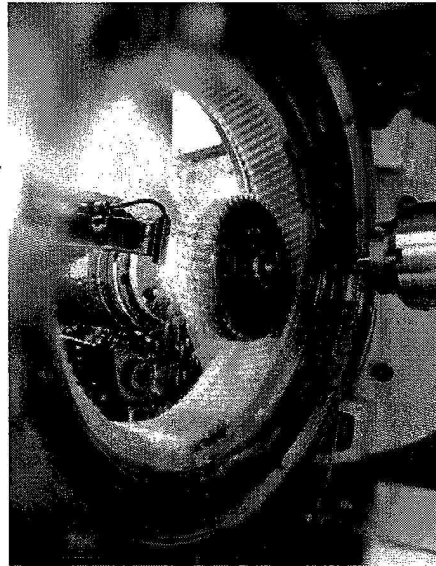
- Increased gear durability
- Consistent residual stress levels
- Reduced wear (micro pitting)
- Stronger gears (more load on the same design)
- Increased warranty life

Source: IWT/Bremen

6

***Spheric Honing
An Alternative Hard Gear
Finishing Process***

*John Lange
Product Mgr.*



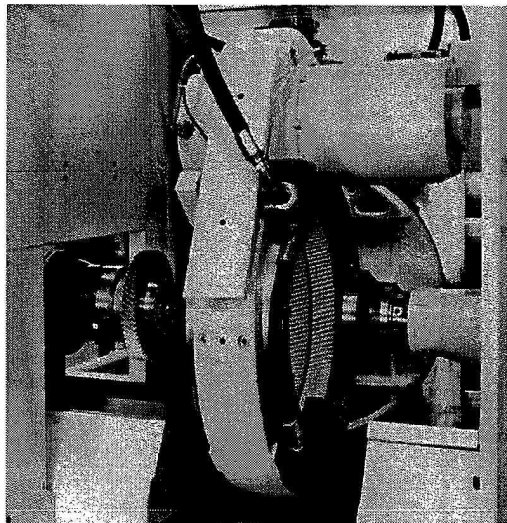
7

Honing

8

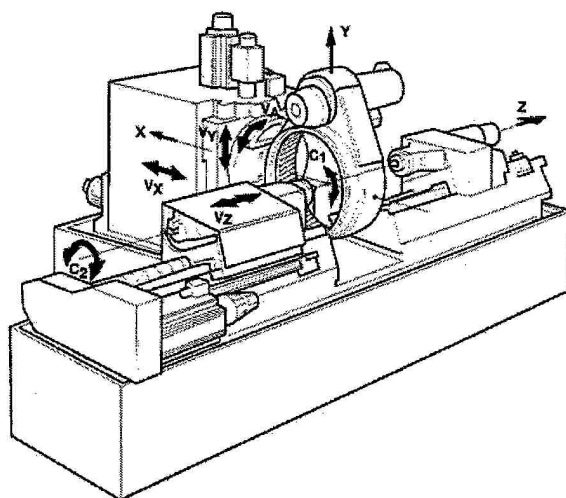
Spheric Honing Machine

- Machining compartment with sealed bulkhead
- Liquid cooled drive system for the honing tool



9

Machine Axes



Machine axes
 $V_x - V_y - V_z - V_A$
 for Spheric Honing

Drive system axes
 $C_1 - C_2$ with
 electronic gear
 box drive

10

